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Randomised controlled trials—the gold standard for effectiveness research

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Randomized controlled trials (RCT) are prospective studies that measure the effectiveness of a new intervention or treatment. Although no study is likely on its own to prove causality, randomization reduces bias and provides a rigorous tool to examine cause-effect relationships between an intervention and outcome. This is because the act of randomization balances participant characteristics (both observed and unobserved) between the groups allowing attribution of any differences in outcome to the study intervention. This is not possible with any other study design.

In designing an RCT, researchers must carefully select the population, the interventions to be compared and the outcomes of interest. Once these are defined, the number of participants needed to reliably determine if such a relationship exists is calculated (power calculation). Participants are then recruited and randomly assigned to either the intervention or the comparator group.[1] It is important to ensure that at the time of recruitment there is no knowledge of which group the participant will be allocated to; this is known as concealment. This is often ensured by using automated randomization systems (e.g. computer generated). RCTs are often blinded so that participants and doctors, nurses or researchers do not know what treatment each participant is receiving, further minimizing bias.

RCTs can be analyzed by intentionto-treat analysis (ITT; subjects analyzed in the groups to which they were randomized), per protocol (only participants who completed the treatment originally allocated are analyzed), or other variations, with ITT often regarded least biased. All RCTs should have pre-specified primary outcomes, should be registered with a clinical trials database and should have appropriate ethical approvals.

RCTs can have their drawbacks, including their high cost in terms of time and money, problems with generalisabilty (participants that volunteer to participate might not be representative of the population being studied) and loss to follow up.

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USEFUL RESOURCES

- CONSORT Statement: CONsolidated Standards of Reporting Trials guidelines designed to improve the reporting of parallel-group randomized controlled trials - http://www.consort-statement.org/consort-2010
- Link to A Randomized, Controlled Trial of Magnesium Sulfate for the Prevention of Cerebral Palsyin the New England Journal of Medicine – A well designed RCT that had a significant impact in practice patterns. http://www.nejm.org/doi/full/10.1056/NEJMoa0801187#t=abstract

LEARNING POINTS

While expensive and time consuming, RCTs are the gold-standard for studying causal relationships as randomization eliminates much of the bias inherent with other study designs.

To provide true assessment of causality RCTs need to be conducted appropriately (i.e. having concealment of allocation, ITT analysis and blinding when appropriate)